

**BIOLOGICAL NOTES ON PHYMATA EROSA SUBSP.
FASCIATA (GRAY) (PHYMATIDAE,
HEMIPTERA).**

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While this insect is a common one, and the subject of many observations, yet little of a definite nature has been published on the details of its life and habits. This paper attempts to supply some of the needed information on this subject.

Systematic Position: *Phymata erosa* appears in Linnaeus' *Systema Naturae* (1), tenth edition, 1758, described as *Cimex erosa*. The insect has also been referred at various times to the genera *Acanthia*, *Syrthis* and *Discomerus*. The subspecies *fasciatus* was described by Gray (2) in 1832 as *Syrthis fasciatus*. In 1897 Handlirsch (14) monographed the family Phymatidae, and at that time designated *Phymata erosa* as an American species exclusively, with *fasciata* Gray as one of the sixteen subspecies. Van Duzee, in his Catalogue of Hemiptera (17), lists *fasciata* as one of the seven subspecies of *erosa* found in America north of Mexico. Several authors, since Handlirsch, have considered *fasciata* to be of specific rank, but I prefer to follow Van Duzee in this.

Previous Work: There have been a good many references to the habits of this insect. The more extensive discussions of the insect have been contributed by Cook (8) and Lintner (12) and are reviewed here.

Cook discusses this insect under the title, "Another Bee Enemy." He refers first to the previous observations of Packard (3), Walsh (4), Glover (6), Uhler (7) and Lintner. Then follow a description, with discussion of the more outstanding structural peculiarities, discussion of habits, and a "verdict" as to its economic status. The segments of the grasping front legs of the insect are incorrectly homologized by Cook. What he considers to be the femur is in reality the distal part of the coxa, while he considers the small basal portion of the coxa alone as constituting that segment; the small trochanter is considered as the tibia, the greatly enlarged femur mistaken for the tarsus, and the curved tibia for the claw. Evidently Cook did not see the true tarsus which is small, two-segmented, and contained, when not in use,

in a groove on the median surface of the tibia. He speaks of the ambushing habits of this bug, and says that it destroys plant lice, caterpillars, beetles, butterflies, moths, bees and wasps. He also reports that the insect will bite humans if handled, referring to it as the "stinging bug."

Lintner (12) gives a complete summary of what has been published concerning the habits of the insect, referring to the contributions mentioned by Cook, and in addition to articles appearing after Cook's paper by Duvall, Riley (10) and Barnard (9). However, his paper adds very little to what had been previously known concerning *Phymata erosa* (Linnaeus).

Handlirsch (14) discusses the biology of the family in general, but not of this species, in his monograph of the Phymatidae. He homologizes the parts of the front leg correctly, figures and describes eggs dissected from the abdomen of a European species, and describes the nymphs of several species.

Fletcher (15) has reported the finding of the eggs of subspecies *wolffii* of this species on limbs of trees in the winter, and describes the eggs briefly.

Heidemann (16) has described the egg of *Phymata erosa* subspecies *fasciata* (Gray), and in addition compares the eggs of the Phymatidae with those of the Reduviidae.

Habitat: Because of its limitations in regard to locomotion this insect, commonly called the ambush bug, must take a position in some place which insects frequent. It is usual, therefore, to find it in or near flowers, or in leaf axils, usually somewhat hidden, either by position, or by its protective coloration, from its prey. It has been taken from golden-rod, roses, milkweed, apple, and many other flowers. It is quite likely that it will conceal itself in any flower which at any particular season is being visited by insects. Its abundance on golden-rod in the fall has been noticed quite frequently and has been ascribed to the similarity in coloration of the insect and the flower. The irregular outline of the insect, indicated in the name "*erosa*," may also be a factor in the "camouflage" of the insect.

The nymphs are not observed as frequently as are the adults. The writer has swept numbers of them from grass and alfalfa plants, and has seen a fifth instar nymph on the upper surface of a leaf of rag-weed, apparently awaiting the approach of some insect.

Feeding Habits: The ambush bug is a predacious insect, but, being unfitted for chasing and pouncing upon its prey, must wait for its food to come to it. Although winged as an adult, and capable of flight, it uses its wings only to get from one plant to another. Its legs are short and incapable of furnishing it with rapid locomotion. Its front legs, while very strong and stout, are not capable of reaching out to any appreciable extent to grasp prey. Its method, then, is to take a position in a flower, to wait until the intended prey is very close to the body, to grab quickly with the strong front legs, and to poison the prey as quickly as possible by inserting the stylets of the beak and injecting the poisonous saliva. The prey is quickly quieted and feeding may proceed without interruption.

Under natural conditions flies and bees serve more often for food than any other insects, since they are the most abundant of the insects frequenting flowers. Small bees are taken as food quite often, and the honey bee is also fed upon. Quite a variety of other insects, as has been indicated earlier, have been recorded as the prey of this insect. The writer found that the adults would feed on house flies imprisoned in their cages. The nymphs were fed smaller flies, and other small insects, such as leaf-hoppers, plant lice, small beetles, etc. It is probable that they will attack almost any insect of suitable size.

Seasonal Life History: There is some question concerning the seasonal life history of this insect. It is usually most abundant in the fall of the year, when numerous adult individuals may be found on such fall flowers as golden-rod, feeding and mating. It is also not unusual to take adults on fruit bloom in the spring, and mating pairs have been observed at this season. The writer has collected adults in the fall, obtained eggs from the females, but has been unable to get any of the eggs to hatch, either during the fall or the following spring. One female, however, was collected as a fifth instar nymph during early June, molted to the adult, was mated to a male caught as an adult, deposited an egg mass late in June which hatched in two weeks, giving rise to a generation which matured in late August. This single record would seem to indicate that there are two generations a year, with the insects hibernating as adults. It is likely, then, that the adults taken in the spring are of the same generation as those so numerous on golden-rod in the fall. However, the evidence is so meager that it is not wise to generalize.

Eggs (Figs. 1 and 2): The eggs are deposited in masses, one layer deep, attached to stems and limbs. The individual eggs are embedded in a frothy mass of spittle-like material, and expose only the circular cap and upper portion of the shell. Heidemann (15) has described the egg as follows:

"Egg, oval and stout; length 1.6 mm., covered with a sticky secretion nearly up to neck; apical cap present, very thin and flat; outer surface of the chorion coarsely granulated, color black; chorial processes form numerous small channels on the chorion inside the rim."

Heidemann also makes the following remarks concerning the eggs of the family in general: "Eggs of the family Phymatidae are evidently closely related to those of the Reduviidae. They have the same peculiar chorial processes which are attached to the inner side of the egg-rim, instead of standing free upon the outside."

The number of eggs to a mass varies from 3 or 4 to over 20, and the average is closer to the higher number. The number of masses, and the total number of eggs deposited by a single female, have not been determined. The act of oviposition has not been witnessed by the writer.

Hatching: In the hatching process the cap is pushed upward slowly, first being tilted from one side, and a white, glistening embryonic membrane is seen. The insect gradually works its way out through the opening, and when part way out, the membrane is seen to break. The nymph continues to free itself from both the membrane and the egg shell, and it may now be seen that the head is bent down against the under side of the body, and that the lateral margins of the abdomen are folded together above the median portion of the abdomen. When the insect is finally free, the skin of the post-natal molt is left attached to the empty shell. The total length of time necessary for hatching, from the time of the first lifting of the cap to completion, is about three minutes. The newly hatched insect is white in color and the lateral margins of the abdomen are elevated.

Length of Stages: Only three individuals of this species have been reared through from adult to adult. The records of these are as follows:

A fifth instar nymph was collected on June 13. This individual was confined and fed, and on June 17 changed to the adult. A male, collected as an adult, was introduced into the cage and the

two were seen to mate several times. The female produced an egg mass of twenty-three eggs on June 27, and died three days later. The eggs hatched on July 10, and three individuals were reared to maturity. The first molted to the second instar on July 21, to the third instar on July 29, to the fourth instar on August 5, to the fifth instar on August 13, and to the adult on August 29. This gives a total of 50 days for nymphal development, and 11 days, 8 days, 7 days, 8 days and 16 days as the lengths of the five nymphal stages in order. The second individual to mature molted to the second instar on July 23, to the third on August 1, to the fourth on August 6, to the fifth on August 15, and to the adult on August 30, requiring 51 days for nymphal development, and 13, 9, 5, 9, and 15 days for the five nymphal stages in order. The third individual molted on July 23, July 29, August 7, August 16, and August 9, requiring 55 days for nymphal development, and 13, 6, 9, 9, and 18 days for the individual stages in order. As has been mentioned before, it is probable that the generation reared was the second generation, the adults from which the eggs were obtained representing the first generation.

DESCRIPTION OF INSTARS.

First Instar (Fig. 3): Length 1.68 mm.; length of fourth antennal segment .2 mm. Color whitish, with median region of abdomen slightly darker after ingestion of food, eyes reddish. Short and broad; head short and broad with two diverging, spine-like processes on anterior margin, and two spine-like processes on each lateral margin above eyes; beak short, stout, curved, three-segmented; antennae short, four-segmented, first segment shortest, fourth swollen, fusiform; thorax and abdomen wider than head, lateral margins expanded and bearing spinous projections as follows: Two lateral projections on prothorax, one on mesothorax, one on metathorax, and one on each of first three segments of abdomen; structure of legs as in adult, tarsi two-segmented; abdomen broadly rounded behind, lateral margins elevated in newly hatched individuals, expanded horizontally in full-fed individuals.

Second Instar (Fig. 4): Length 2.46 mm.; length of apical antennal segment .29 mm. Color as in preceding, with under side of abdomen darker. Head armed as in preceding, with anterior projections comparatively shorter, broader, less spine-like; lateral margin of prothorax armed with two, and lateral margins of

meso- and metathorax and of first three abdominal segments each armed with a single angular projection, giving serrate appearance to margin. Openings of dorsal stink glands visible at anterior margins of abdominal segments 4 and 5; abdomen nearly flat above, convex below.

Third Instar (Fig. 5): Length 3.17 mm.; length of fourth antennal segment .4 mm. Color dirty whitish, eyes reddish, openings to dorsal stink glands faintly indicated by fuscous, darker color of ingested food visible through walls of abdomen. Head short and broad, narrower before the eyes, with two anterior dorsal spinous projections, and a prominent forked spine on either side above and behind the eyes, with a smaller spine above and before the eyes; thorax and abdomen much wider than head, lateral margins expanded; pronotum with two pairs of spines along anterior margin, the more lateral at the antero-lateral angles, and the extreme lateral portion of the pronotum produced and angled; meso- and metanota and first three abdominal segments also angled laterally; no trace of distinct wing pads in this instar.

Fourth Instar (Fig. 6): Length 5.22 mm.; length of fourth antennal segment .61 mm. Color slightly darker than preceding, dirty whitish with greenish tinge, sometimes reddish in region of dorsal stink gland openings, eyes reddish. Head somewhat longer and more slender than in preceding, anterior projections of head more rounded, granulate; each lateral margin of head provided with two double spines, one above and before, the other above and behind the eyes; pronotum broadly expanded, margins elevated in some instances, spinous and granulate along antero-lateral and lateral margins; mesonotum wider than pronotum, rounded laterally, extended posteriorly into wing pads; metanotum shorter and narrower than mesonotum, rounded laterally; abdomen broad, rounded posteriorly, segments 1-3 angled postero-laterally; openings to dorsal stink glands visible on anterior margins of segments four and five.

Fifth Instar (Fig. 7): Length 7 mm.; length of fourth antennal segment .86 mm. Color as in fourth instar, though decidedly darker just previous to molting to adult. Head much as in preceding, with lateral projections comparatively shorter and less spine-like; pronotum slightly elevated laterally, lateral margins finely serrate, with three more distinct angles; wing pads of both meso- and metathorax well developed, extended caudo-laterally, apices somewhat elevated, their longitudinal axes forming

angle of 90 degrees with longitudinal axis of body, metathoracic pads almost concealed by mesothoracic pads; abdomen gradually widened to apex of fourth abdominal segment, from here narrowed to form rounded posterior margin; openings to dorsal stink glands visible at anterior margins of segments four and five of abdomen.

Note: These observations and rearings were made during the summer of 1926, at the insectary of the University of Kansas, Lawrence, Kansas.

LITERATURE.

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EXPLANATION OF PLATE.

Phymata erosa subspecies *fasciata* (Gray).

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| 1. Egg mass. | 6. Fourth nymphal instar. |
| 2. Individual egg. | 7. Fifth nymphal instar. |
| 3. First nymphal instar. | 8. Adult female. |
| 4. Second nymphal instar. | 9. Front leg—inner surface. |
| 5. Third nymphal instar. | 10. Front leg—outer surface. |